

ENERGY \$AVER\$

"... For Business and Industry".

VOLUME 3 / NUMBER 3

DELIVERING THE SAVINGS THROUGH EFFICIENT ROUTE PLANNING

The Facts ...

By improving route planning, vehicle fleet owners can save on fuel costs while maintaining a high level of customer service. Better routing also makes it possible to service customers faster with the same number of vehicles.

For many types of operations, improved route planning has the potential to produce a fuel cost saving of 15 per cent or more and reduce labour cost, maintenance cost and the amount of capital invested in vehicles. Travel time is also reduced.

Consolidating routes so that vehicles are used as fully as possible results in fewer or shorter trips. The method involves developing a delivery schedule that eliminates overlapping routes and doubling back. In some instances, a reduction in the number of vehicles is possible. This allows more time for preventative maintenance and it makes it possible to cut down the use of less fuel-efficient vehicles.

Route planning can be as simple as listing service stops, dividing the stops into geographical zones, using a map to organize routes of the least distance and then assigning vehicles. It can be more complex for larger companies as the fleet size and number of stops increase.

The first step in developing a plan is to keep appropriate records. These can include:

- complete list of customers
- fuel used by each vehicle
- fuel cost
- distance travelled per day on each route
- number of stops or deliveries per trip
- number of pieces or volume or weight per stop
- total work hours per day for each vehicle
- average loading/unloading time at each stop, and
- routes taken by each vehicle

This information will provide base line or status quo data for comparison when tracking the savings after implementing an energy management program.



Scott National shipping and receiving area, Edmonton

To find the best route and schedule for each vehicle, plot delivery and pick-up locations and other relevant information on a map. It is necessary to establish a delivery schedule for each vehicle, the travel times per trip and the minimum frequency of service required by customers. The resulting map for a typical day or week, will show whether more than one vehicle is in each area or zone and how much backtracking is taking place.

Using the map, delivery, pick-up or service locations should be grouped into zones. A series of overlays can then be prepared with alternative routing systems. From the overlays, the total travel distance and volume (or weight) for each proposed route can be calculated. The next step is to refine the routes until the minimum distance is determined and the volume (or weight) carried per vehicle is close to capacity.

Owners and operators of vehicle fleets may find it useful to add zone codes to order/packing forms and to use a specific loading dock or area for each zone.

The total distance travelled on the new routes can sometimes be further reduced by combining pick-ups and deliveries.

Fleet managers should consider traffic flow when planning routes. One stop per kilometre can increase fuel use by up to 30 per cent. Every time

a vehicle stops and then accelerates to normal driving speed, more fuel is used. Brake and engine life are also reduced. Planning a route that avoids traffic or runs counter to heavy traffic flow, saves by reducing fuel and maintenance costs.

Fuel is wasted when drivers have to speed, brake sharply or use rapid starts. Situations where drivers rush to meet deadlines should be avoided. When feasible, travel should be during non-rush hour times such as early morning, evening or at night to allow drivers to make more deliveries per hour. Loading and unloading during peak traffic hours can help avoid being on the road in heavy traffic.

Smooth road surfaces can reduce fuel consumption 10 to 30 per cent. A flat route is preferable to a hilly one, especially when the vehicle is fully loaded. (Fuel use can double on a seven per cent grade.)

If appropriate (e.g. for pick-ups when fast response is required), consider using radio-controlled vehicles to change routing. Alternately, drivers can periodically phone the home base. Both methods can help improve the routes and reduce dead-head trips.

Assigning the appropriate vehicle for the load will save fuel. A fuel guzzler should not be assigned a route that a smaller fuel-efficient vehicle can handle. The objective is to increase the route volume per truck so that a given amount of freight can be moved using fewer trips. Eighty-five per cent of load capacity can be a practical goal. In some cases, it may be better to use two small vehicles rather than one larger one. When appropriate, consider purchasing a combination-load truck which can accommodate both side-and-rear-delivery situations.

Developing an efficient route plan need not be complicated or expensive. Taking simple, practical steps makes it possible for fleet owners to serve customers more efficiently while achieving significant fuel cost savings.

The Application ...

Scott National is one of Alberta's largest food distributors, with depots in Edmonton, Calgary, Red Deer, Grande Prairie, Peace River and Medicine Hat. Energy audits had been done on their buildings in Edmonton and Calgary. By following the building audit recommendations, significant savings were achieved. "We wanted to try the energy audits on our vehicle fleets as well," says Jim Kenny, director of maintenance and mechanical services.

Scott National in Edmonton was the first fleet operator in Alberta to participate in the newly developed transportation audit of the Alberta Energy Efficiency Branch.

During the audit, the first consideration was route planning. Scott National wanted to modify its routes rather than make major changes. The company recognized that this could mean lower potential savings, but major changes could mean more disruption to existing practices. Nonetheless, the energy auditors' report showed a potential saving of 10 per cent could be achieved by modifying routes. This saving was confirmed by the company after implementation of the proposed changes.

The original routes and the feasibility of proposed routes for two typical days were verified with the truck drivers. The routing computer analysis done by the energy audit staff showed a potential annual fuel cost saving of \$6714 (21 920 litres) if all the proposed route changes were made. The computer analysis showed that:

- backtracking could be reduced, and, in some cases, eliminated
- overlapping of routes could be reduced
- use of congested roads could be reduced

Scott National implemented changes by re-assigning route numbers within their computer system. Drop-off points within the boundaries of the proposed new routes were assigned a new route number and, in some cases, a new drop-off point number. Following the audit the company planned more routing changes including revising the frequency of deliveries and arranging some new delivery times to avoid backtracking. Scott National has installed monitoring equipment to keep track of its fleet's energy costs.

The Bottom Line ...

The transportation energy audit of Scott National's operation in Edmonton shows that routing changes can be a low-cost and worthwhile way to improve energy efficiency, reduce fuel cost and even improve delivery time.

The easiest method of determining the economic merit of proposed routes is to measure the total distance travelled before and after routing changes and calculate the annual fuel cost savings based on the reduced distance.

For the example provided, the savings can be determined by subtracting the distance travelled after route changes from the distance travelled before ($5000 - 4000 = 1000$). Divide the difference by the distance

EXAMPLE

Existing conditions:

Weekly distance travelled before route changes	5000 km
Annual fuel cost	\$40,000

Potential conditions:

Weekly distance travelled after route changes	4000 km
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travelled before, and multiply by 100 to get the percentage distance saved ($1000/5000 \times 100 = 20$ per cent).

Annual fuel cost savings:

$$\frac{20}{100} \times \$40\,000 = \$8000$$

The payback period in months is estimated by dividing the cost of making the routing changes by the annual savings, multiplied by 12 months of the year. The payback period can be short, depending on the type of operation and the complexity of the routing required.

As well as fuel cost savings, vehicle fleet managers have reported that driver overtime and missed delivery deadlines can be eliminated with improved routing.

Drivers can complete deliveries in less time, have more time for customers, and have less pressure to speed. The result is increased productivity.

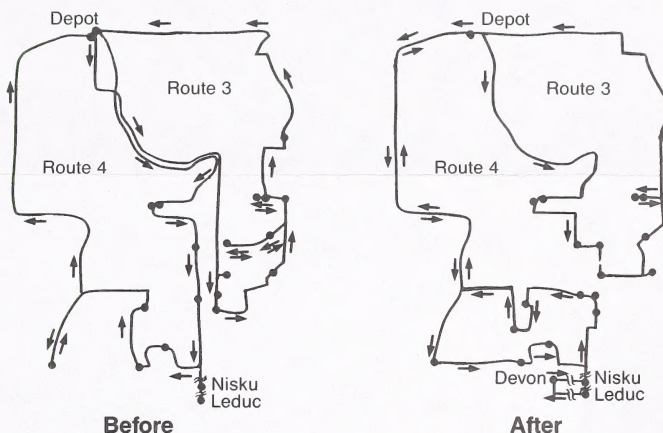
When drivers are not rushed to meet deadlines, they can avoid speeding,

braking sharply and using rapid starts, and can take more care to avoid bumping or scraping in tight spots. Reduced maintenance costs can be expected because of less wear on engines, brakes and other systems.

Managers also report that drivers appreciate the interest shown by management in improving their routes, and making their jobs easier. Driver turnover can be reduced due to improved driver satisfaction and rapport with management.

FIGURE 1

Example Routes (Before and After Computer Analysis)



SECTOR REVIEW

Energy Use in Transportation

Energy (vehicle fuel) use varies widely, depending on the commercial or industrial activities served by the vehicle fleet.

A transportation energy audit determines how energy is being used and how much it costs in each area. Energy conservation measures are then identified which can result in energy cost savings.

Energy consumption for transportation is second only to that of industry. Transportation required 28 per cent of the energy used in Alberta in 1988 as shown in Figure 2.

Eighty-three per cent of all oil used in the province in 1988 was for trans-

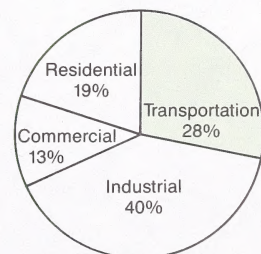
portation in the form of gasoline (50 per cent), diesel (25 per cent) and aviation fuels (8 per cent) as Figure 3 indicates.

Transportation energy audits of 12 companies by staff of Alberta's Energy Bus audit program have shown there is good potential for energy cost savings. Total energy cost at these 12 companies is about \$515 000 annually. Of this amount, Energy Bus staff identified a potential reduction in fuel costs associated with route planning of about \$99 000 or 19 per cent.

Of the different areas evaluated during transportation audits, route planning represents the greatest potential saving as indicated in Figure 4.

FIGURE 2

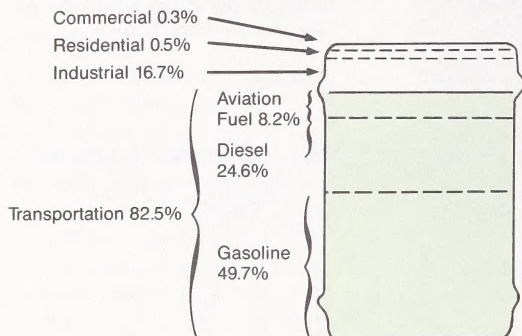
Energy Use by Sector in Alberta



Source:
ERCB, *Energy Requirements in Alberta 1989-2003, Report 89-A*, May, 1989, Calgary, 23-45.

FIGURE 3

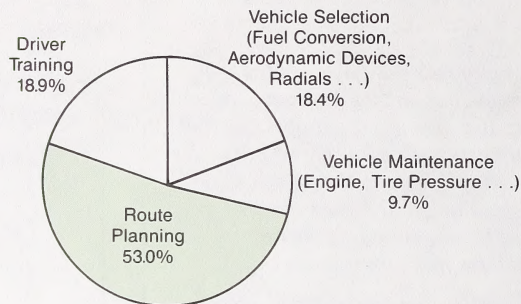
Sector Use of Refined Petroleum Products (Oil) in Alberta



Source: ERCB, *Energy Requirements in Alberta 1989-2003*, Report, May, 1989, 23-45.

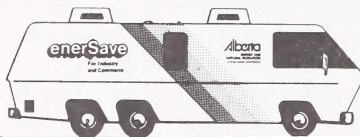
FIGURE 4

Potential Energy Saving Areas



FOR MORE INFORMATION

The article *Delivering The Savings Through Efficient Route Planning* was researched by Doug MacLean, the Sector Review completed by Brian Weir. For detailed information on energy cost-saving calculations and the energy audit database, contact the Technical Services Section of the Energy Efficiency Branch: Phone 427-5200 (collect).



ENERGY \$AVERS\$

Energy Saver\$ is a series of fact sheets about energy efficiency measures that have wide application in Alberta. Each issue highlights a different technology and its successful use in the province. The Sector Review summarizes energy use patterns of different facilities that have used Alberta's Energy Bus audit service. Comments, questions, and suggestions are welcome.

Write or phone (collect) to be placed on the mailing list. You may also receive back issues or arrange for an Energy Bus audit (conducted at no charge).
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